REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Addingvendor 50507 for device type 02XX. Change to reflect MIL-H-38534 processing. Editorial changes throughout.	91-10-22	G. A. Lude

REV																				
SHEET																				
REV																				
SHEET																				

REV STATUS OF SHEETS	REV	A	A	A	A	A	A	A	A	A	A	A	A	A	
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	

PMIC N/A

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

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DRAWING APPROVAL DATE
89-07-12

REVISION LEVEL
A

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUITS, LINEAR, 12-BIT ANALOG TO DIGITAL, CONVERTER, HYBRID

SIZE	CAGE CODE	
A	67268	5962-88508

SHEET 1 OF 13

DESC FORM 193
SEP 87

5962-E273

1. SCOPE

1.1 Scope. This drawing describes device requirements for class H hybrid microcircuits to be processed in accordance with MIL-H-38534.

1.2 Part or Identifying Number (PIN). The complete PIN shall be as shown in the following example:

5962-88508	01	X	X
Drawing number	Device type (See 1.2.1)	Case outline (See 1.2.2)	Lead finish per MIL-H-38534

1.2.1 Device type(s). The device type(s) shall identify the circuit function as follows:

Device type	Generic number	Circuit function	Conversion time
01	ADC-HX	12-bit A/D Converter	20 µs
02	ADC-HZ,MNADC87H	12-bit A/D Converter	8 µs

1.2.2 Case outline(s). The case outline(s) shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
X	See figure 1 (32-lead, 1.72" x 1.10" x .235"), dual-in-line package

1.3 Absolute maximum ratings.

Positive supply voltage (V_{CC})	-0.3 to +18 V dc
Negative supply voltage (V_{EE})	+0.3 to -18 V dc
Logic supply voltage (V_{DD})	-0.3 to +7 V dc
Analog input voltage	-25 V
Buffer input voltage	$\pm V_S$
Digital inputs	+5.5 V
Junction temperature (T_J)	+175°C
Storage temperature	-65°C to +150°C
Power dissipation (P_D), T_C = +25°C	2 W
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance:	
Junction-to-case (Θ_{JC})	13°C/W
Junction-to-ambient (Θ_{JA})	41°C/W

1.4 Recommended operating conditions.

Positive supply voltage range (V_{CC})	+14.5 to +15.5 V dc
Negative supply voltage range (V_{EE})	-14.5 to -15.5 V dc
Logic supply voltage range (V_{DD})	+4.5 to +5.5 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specifications and standard. Unless otherwise specified, the following specifications and standard of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.
MIL-H-38534 - Hybrid Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specifications, and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-H-38534 and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-H-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Functional diagram and input connection table. The functional diagramand input connection table shall be as specified on figure 3.

3.2.4 Truth table(s). The truth table(s) shall be as specified on figure 4.

3.2.5 Timing diagram. The timing diagram shall be as specified on figure 5.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Resolution	RES	Digital and serial	1,2,3	12		BIT
Unipolar coding	UC	Complementary binary (see 4.3.1b)	7,8			
Bipolar coding	BC	Complementary offset binary (see 4.3.1b)	7,8			
Unipolar input (coding)		0 to +10 V range, $T_A = +25°C$ See figure 3 for input connections (see 4.3.1b)	7			
Unipolar input (coding)		0 to +5 V range, $T_A = +25°C$ See figure 3 for input connections (see 4.3.1b)	7			
Bipolar input (coding)		-2.5 to +2.5 V range, $T_A = +25°C$ See figure 3 for input connections (see 4.3.1b)	7			
Bipolar input (coding)		-5 to +5.5 V range, $T_A = +25°C$ See figure 3 for input connections (see 4.3.1b)	7			
Buffer bias I	BIAS	$T_A = +25°C$ 2/	1		250	nA
Buffer offset error	BUFOE		1,2,3		10	mV
Nonlinearity	NL	End-point method	4		0.5	LSB
			5,6		1	
Differential nonlinearity	DNL		4	-0.75	+0.75	LSB
			5,6	-1	+1	
Differential nonlinearity drift	$\Delta DNL/\Delta T$	$T_A = -55°C, +125°C$	8		1.22	ppm/°C

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Limits Min	Limits Max	Unit
Unipolar gain error	UGE	0 V to 10 V range	4		0.2	%FSR
			5,6		0.4	
Unipolar gain error drift	ΔUGE /ΔT	0 V to 10 range T_A = -55°C, +125°C	8		20	ppmFSR /°C
Bipolar gain error	BGE	-10 V to +10 V range	4		0.2	%FSR
			5,6		0.4	
Bipolar gain error drift	ΔBGE /ΔT	T_A = -55°C, +125°C -10 V to +10 V range See figure 3 for input connections	8		20	ppmFSR /°C
Unipolar offset error	UOE	0 to +10 V range See figure 3 for input connections	4		0.1	%FSR
			5,6		0.2	
Unipolar offset error drift	ΔUOE /ΔT	T_A = -55°C, +125°C 0 to +10 V range See figure 3 for input connections	8		5	ppm/°C
Bipolar offset error	BZE	-10 to +10 V range See figure 3 for input connections	1		0.2	%FSR
			2,3		0.4	
Bipolar offset gain error	ΔBZE /ΔT	T_A = -55°C, +125°C -10 V to +10 V range See figure 3 for input connections	8		10	ppm/°C
No missing codes	NMC	Abbreviated test	4,5,6	pass		BIT

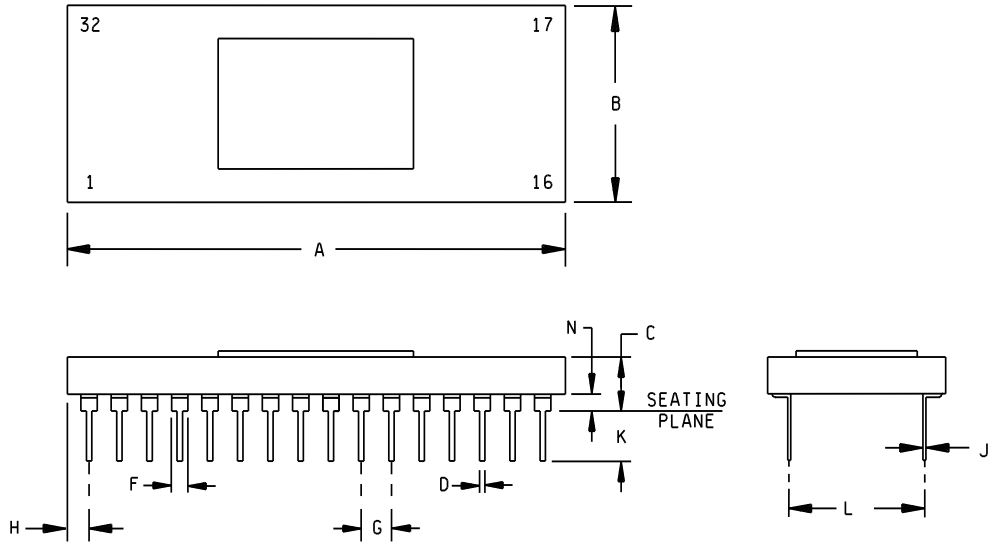
See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Limits Min	Limits Max	Unit
Conversion time	t_c	See figure 5 Device 01	9,10,11		20	µs
		Device 02			8	
Internal reference error	V_{REF}	From 6.300 V $T_A = +25°C$	1	-126	+126	mV
Internal reference error drift	$V_{REF}/\Delta T$	$T_A = -55°C, +125°C$	8		20	ppm/°C
Serial/parallel match	MTCH	Random codes $T_A = +25°C$	7	pass		
Digital output voltage (high)	V_{OH}	2 TTL loads	1,2,3	2.4		V
Digital output voltage (low)	V_{OL}	2 TTL loads	1,2,3		0.4	V
Power supply rejection ratio (low)	PSRR	$V_S = \pm5\%$	1,2,3		0.004	%/%V_S
Quiescent supply current:						
Positive supply	ICC	$V_{CC} = +15.5$ V	1,2,3		35	mA
Negative supply	I_{EE}	$V_{EE} = -15.5$ V			-40	
Logic supply	I_{DD}	$V_{DD} = 5.5$ V			124	
Power dissipation	P_D	Nominal supply voltages	1,2,3		1.69	W

1/ Unless otherwise specified the following conditions only:
V_{CC} = +15 V dc
V_{EE} = -15 V dc
V_{DD} = +5 V dc
Logic "O" = +0.8 V dc
Logic "1" = +2.0 V dc
VFSR = 20 V
Bipolar operation

2/ Parameter shall be tested as part of device initial characterization and after design and process changes. Parameter shall be guaranteed to limits specified in table I for all lots not specifically tested.



Dim	Inches		Millimeters	
	Min	Max	Min	Max
A		1.720		43.69
B	.880	1.100	22.35	27.94
C		.235		5.97
D	.016	.021	0.41	0.53
F	.040 TYP		1.02 TYP	
G	.100 BASIC		2.54 BASIC	

Dim	Inches		Millimeters	
	Min	Max	Min	Max
H	.090	.110	2.29	2.79
J	.009	.015	0.23	0.38
K	.150	.211	3.81	5.36
L	.890	.920	22.61	23.37
N	.015	.060	0.38	1.52

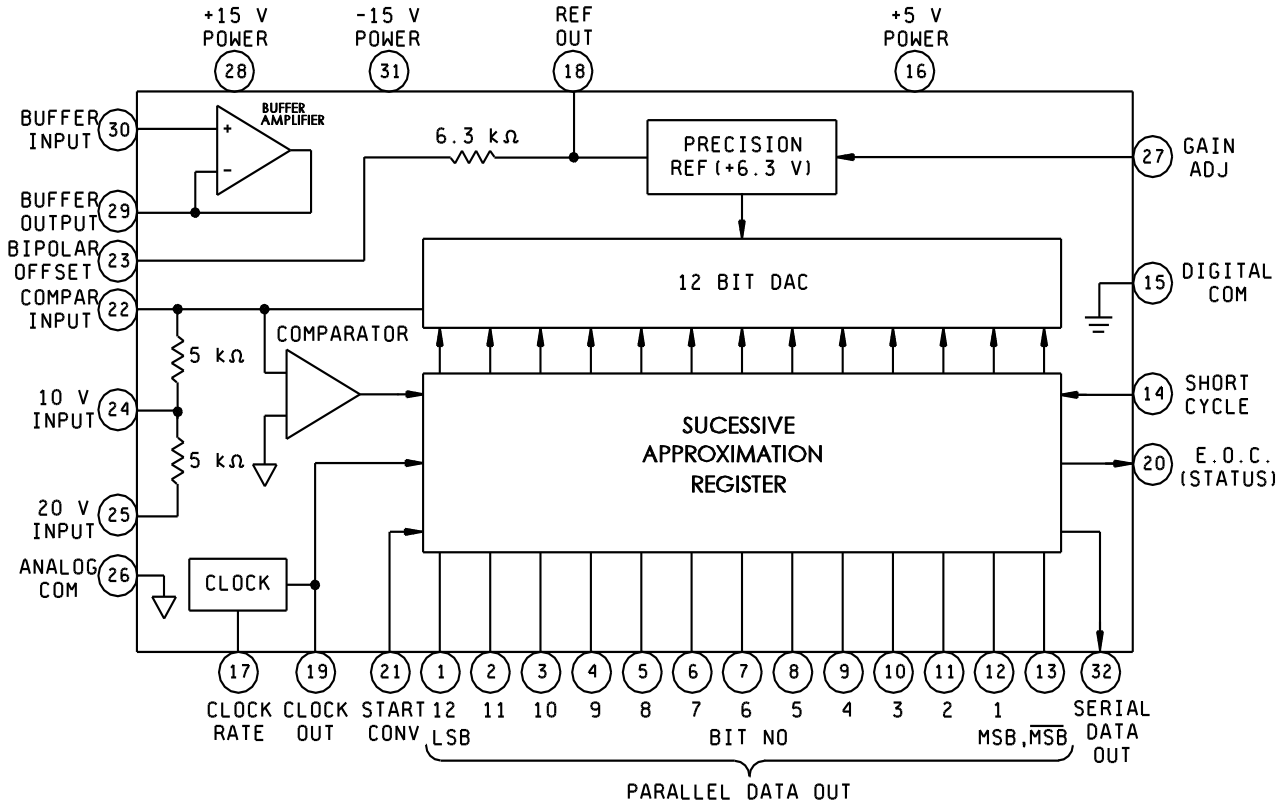
NOTES:
1. Leads in true position within 0.010 inch (0.25 mm) R at NMC at seating plane.
2. PIN numbers shown for reference only. Pin 1 index is required.

FIGURE 1. Case outline.

Device types	01 and 02	Device types	01 and 02
Case outlines	X	Case outlines	X
Terminal number	Terminal symbol	Terminal number	Terminal symbol
1	Bit 12 out (LSB)	17	Clock rate
2	Bit 11 out	18	Ref out
3	Bit 10 out	19	Clock out
4	Bit 9 out	20	E.O.C. (status)
5	Bit 8 out	21	Start convert
6	Bit 7 out	22	Compar iput
7	Bit 6 out	23	Bipolar offset
8	Bit 5 out	24	10 v range
9	Bit 4 out	25	20 v range
10	Bit 3 out	26	Analog com
11	Bit 2 out	27	Gain ADJ
12	Bit 1 out (MSB)	28	V_{CC}
13	Bit 1 out (MSB)	29	Buffer output
14	Short cycle	30	Buffer input
15	Digital com	31	V_{EE}
16	V_{DD}	32	Serial output

FIGURE 2. Terminal connections.

Functional diagram



Input connection table

Input volt range	Without buffer			Input PIN	Without buffer		
	Input PIN	Connect these pins together			Connect these pins together		
0 to +5 V	24	22 to 25	23 to 26	30	22 to 25	23 to 26	29 to 24
0 to +10 V	24	---	23 to 26	30	---	23 to 26	29 to 24
±2.5 V	24	22 to 25	23 to 22	30	22 to 25	23 to 22	29 to 24
±5 V	24	---	23 to 22	30	---	23 to 22	29 to 24
±10 V	25	---	23 to 22	30	---	23 to 22	29 to 25

FIGURE 3. Functional diagram and input connection table.

Unipolar coding table

Input range		Complementary binary coding
0 to + 10 V	0 to +5 V	MSB LSB
+9.9976 V	+4.9988 V	0000 0000 0000
+8.7500 V	+4.3750 V	0001 1111 1111
+7.5000 V	+3.7500 V	0011 1111 1111
+5.0000 V	+2.5000 V	0111 1111 1111
+2.5000 V	+1.2500 V	1011 1111 1111
+1.2500 V	+0.6250 V	1101 1111 1111
+0.0024 V	+0.0012 V	1111 1111 1110
+0.0000 V	+0.0000 V	1111 1111 1111

Bipolar coding table

Input voltage range			Complementary offset binary	Complementary two's complement
±10 V	±5 V	±2.5 V	MSB LSB	MSB LSB
+9.9951 V	+4.9976 V	+2.4988 V	0000 0000 0000	1000 0000 0000
+7.5000 V	+3.7500 V	+1.8750 V	0001 1111 1111	1001 1111 1111
+5.0000 V	+2.5000 V	+1.2500 V	0011 1111 1111	1011 1111 1111
0.0000 V	+0.0000 V	+0.0000 V	0111 1111 1111	1111 1111 1111
-5.0000 V	-2.5000 V	-1.2500 V	1011 1111 1111	0011 1111 1111
-7.5000 V	-3.7500 V	-1.8750 V	1101 1111 1111	0011 1111 1111
-9.9951 V	-4.9976 V	-2.4988 V	1111 1111 1110	0111 1111 1110
-10.0000 V	-5.0000 V	-2.5000 V	1111 1111 1111	0111 1111 1111

FIGURE 4. Truth tables.

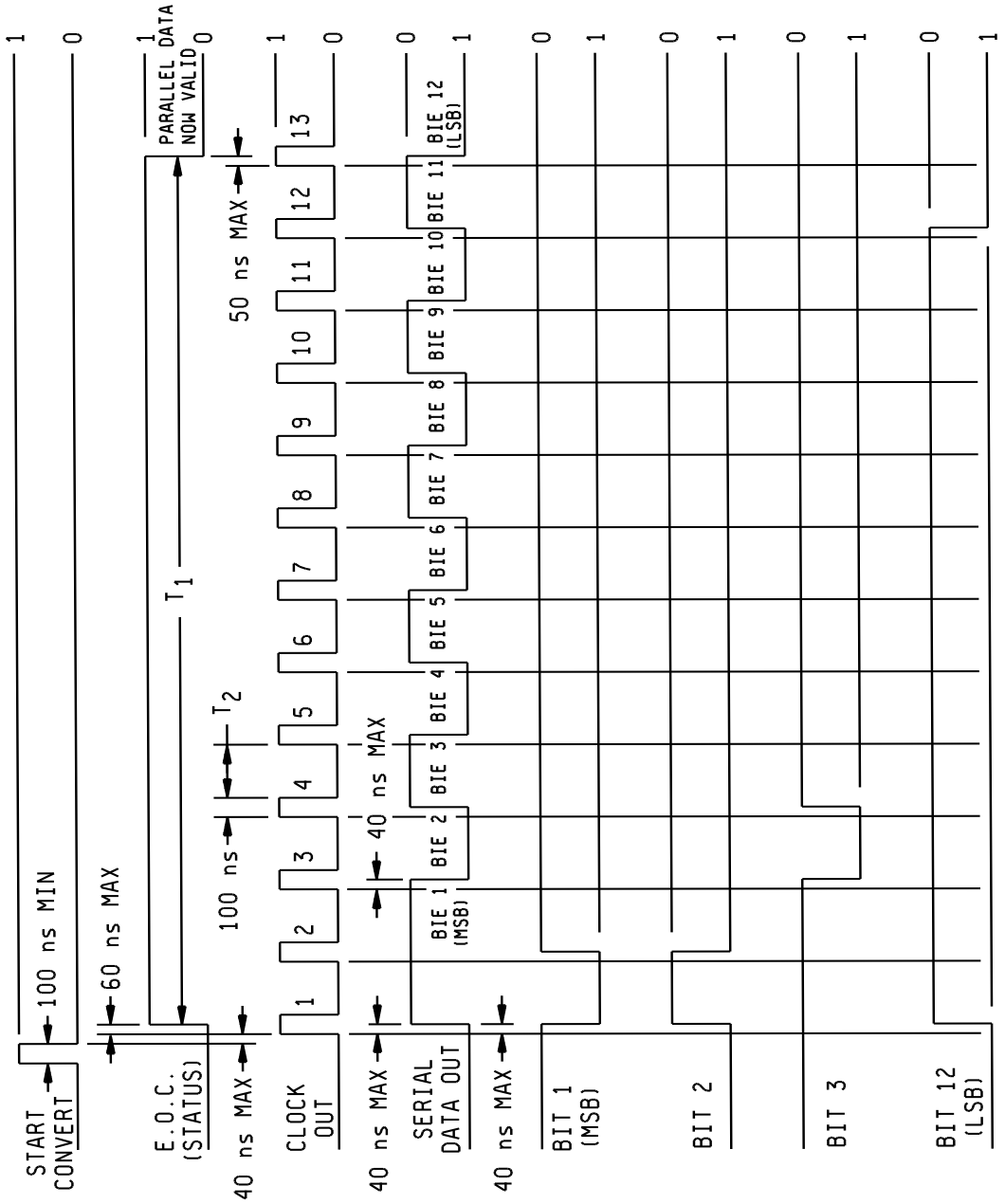


FIGURE 5. Timing diagram

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5008, group A test table)
Interim electrical parameters	1
Final electrical test parameters	1*,2,3,4,5,6,7, 8,9,10,11
Group A test requirements	1,2,3,4,5,6,7,8, 9,10,11
Group C end-point electrical parameters	1

* PDA applies to subgroup 1.

3.5 Marking. Marking shall be in accordance with MIL-H-38534. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in QML-38534 (see 6.6 herein).

3.6 Manufacturer eligibility. In addition to the general requirements of MIL-H-38534, the manufacturer of the part described herein shall submit for DESC-ECC review and approval electrical test data (variables format) on 22 devices from the initial quality conformance inspection group A lot sample, produced on the certified line, for each device type listed herein. The data should also include a summary of all parameters manually tested, and for those which, if any, are guaranteed.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in QML-38534 (see 6.6 herein). The certificate of compliance submitted to DESC-ECC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-H-38534 and the requirements herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-H-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-H-38534.

4.2 Screening. Screening shall be in accordance with MIL-H-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.7 herein).

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-H-38534 and as specified herein.

4.3.1 Group A inspection. Group A inspection shall be in accordance with MIL-H-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 7 and 8 shall include verification of input-to-output coding (see figure 4 herein).

4.3.2 Group B inspection. Group B inspection shall be in accordance with MIL-H-38534.

4.3.3 Group C inspection. Group C inspection shall be in accordance with MIL-H-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.7 herein).

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection. Group D inspection shall be in accordance with MIL-H-38534.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-H-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for original equipment design applications and logistic support of existing equipment.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings.

Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-ECC, telephone (513) 296-8527.

6.5 Comments. Comments on this drawing should be directed to DESC-ECC, Dayton, Ohio 45444, or telephone (513) 296-8525.

6.6 Approved sources of supply. Approved sources of supply are listed in QML-38534. Additional sources will be added to QML-38534 as they become available. The vendors listed in QML-38534 have agreed to this drawing and a certificate of compliance (see 3.7 herein) has been submitted to and accepted by DESC-ECC.

STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE: 91-10-22

Approved sources of supply for SMD 5962-88508 are listed below for immediate acquisition only and shall be added to QML-38534 during the next revision. QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DESC-ECC. This bulletin is superseded by the next dated revision of QML-38534.

Standardized military drawing PIN	Vendor CAGE number	Vendor similar PIN 1/
5962-8850801XX	50721	ADC-HX/883B
5962-8850802XX	50721 50507	ADC-HX/883B MNADC87H/B

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
50507	Unitrode Corporation Micro Networks Division 324 Clark Street Worcester, MA 01606
50721	Datel, Incorporated 11 Cabot Boulevard Mansfield, MA 02048